Macroinvertebrate Communities of the Backwaters, Side Channels, and Rice Lake of the St. Croix River in July 2010.

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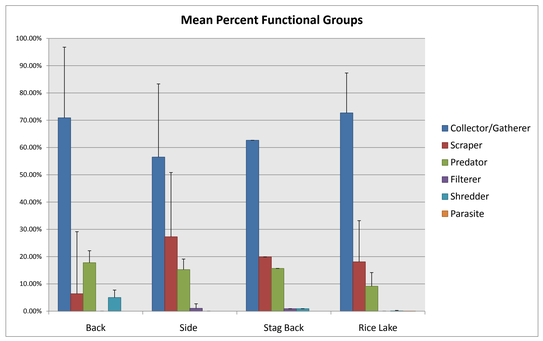
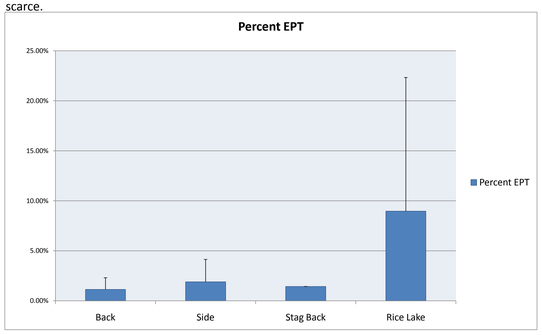
Abstract

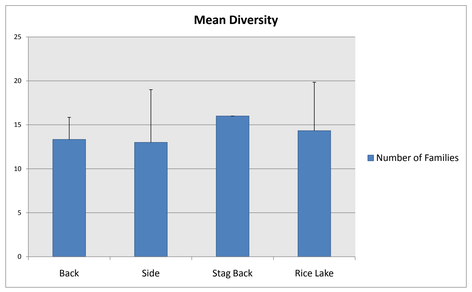
This project was part of the Science Training And Research Skills (STARS) program at St. Croix Watershed Research Station (SCWRS) and was funded by the National Park Service (NPS). Macroinvertebrates are known to be an essential component of any aquatic ecosystem. They are the main source of food for many species of fish and help break down detritus that settles out of water bodies (Wallace, J.B. and J.R. Webster, 1996). Some families of macroinvertebrates are also good indicators of water quality. This project aims to help assess macroinvertebrate communities in the backwaters and side channels of the St. Croix River. A total of ten sites were selected for this study in four separate habitats. The backwater, side channel, and Rice Lake habitats all had 3 sampling sites to give the most comprehensive view of all the subhabitats in the area, while the stagnant backwater habitat was small so only one sample was taken. The main channel was not sampled due to the high water in July and its overwhelming number of subhabitats. Each site was sampled using two people with dip nets for 10 minutes in a 10 square meter area. Water quality readings were also taken at each habitat with a YSI sonde and bottled samples were taken for further labwork. This project found that all habitats sampled were dominated by macroinvertebrates in the collector/gatherer feeding group. Rice Lake had the most macroinvertebrates, but also the highest variance. Rice Lake had the highest percent EPT, indicating a high habitat quality compared to other sites. Diversity was highest in the stagnant backwater, but almost all the other habitats had a variance that could easily put them above the stagnant backwater site.



All sites were dominated by the collector/gatherer functional group and by scrapers after that. Predators were relatively constant throughout the habitats, and other feeding groups were scarce.



Rice Lake had the highest ratio of Ephemeroptera, Plecoptera, and Trichoptera (EPT) orders to non EPT orders by far, which may again be due to the flow and relatively stable ecosystem of a lake.



The stagnant backwater had the highest diversity, perhaps because of the relative stability of a closed backwater compared to other river sites. However, other sites had a variability that goes well above the stagnant backwater diversity.

Flow Estimate m/s	T1	T2	T3	Mean
Side	0.100	0.077	0.087	0.088
Back	0.000	0.000	0.000	0.000
Stag Back	0.000	0.000	0.000	0.000
Rice Lake	0.050	0.040	0.070	0.053

This table shows the estimated surface flow in m/s of each site. The side channel habitat had the highest flow with Rice Lake close behind it. The backwater and stagnant backwater had either no surface flow or it was undetectable

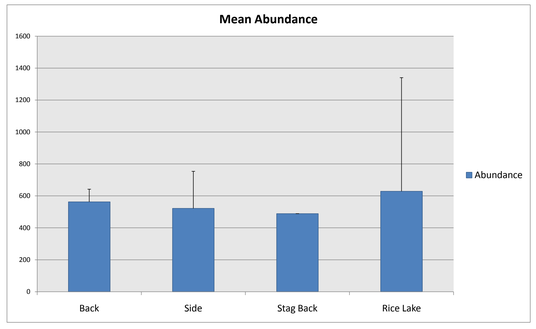
Water Quality	Temp °C	Spec Con mS/cm	DO mg/L	pH	% DO
Back	23.79	0.242	8.88	8.26	115.57
Side	23.98	0.166	6.07	7.47	73.50
Stag Back	23.26	0.139	3.17	7.24	43.2
Rice Lake	26.08	0.176	4.76	7.39	72.19

Rice Lake was the warmest habitat which was surprising because the stagnant backwater has no flow. However it was in the shade which likely helps keep it cool. PH was highest in the backwater which is likely due to the macrophytes that live there in great masses. These macrophytes also gave the backwater the greatest DO and % DO because of the extra oxygen they put in the environment.

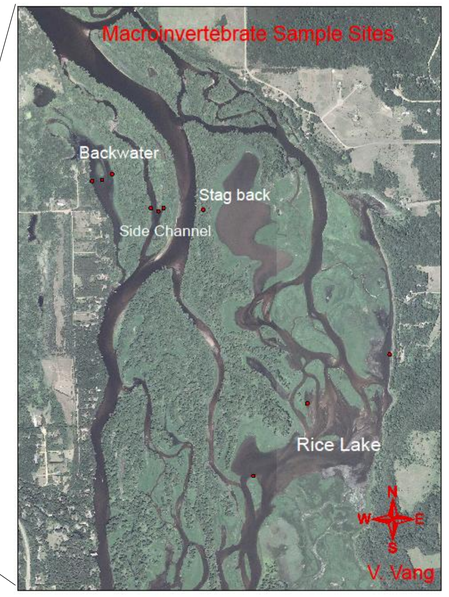
Methods

Each site was marked with a GPS after sampling and flow estimates were taken by placing a neutrally buoyant flask in the water and recording the time it took to travel two meters. Substrate types were estimated by what came up in the nets and by observation. Water quality samples were taken with a YSI handheld sonde one meter under the surface in the most integrated area of the habitat.

Each site was sampled with a dip net by two people for 10 minutes in a 10 square meter area. As the nets were filled they were periodically dumped into a 5 gallon bucket with water to rinse the net. Once the area had been sampled and all organisms were in the bucket two small pore filters were used to separate the water from the organisms. The organisms were then put in bottles and whirl packs with 95% alcohol and sorted to taxonomic order in a sorting pan at the lab. Most were then sorted with a dissecting microscope to taxonomic family.



Rice Lake had the highest mean abundance, most likely due to the lower flow that brings in new nutrients but keeps water level relatively constant. It also had the highest diversity of subhabitats. This site was highly variable, and the side channel and backwater had much less deviation between subhabitats.



Conclusions

•Intermediate flow supported organisms that generally require higher quality water. The intermediate flow brings nutrients and food in at a rate where the organisms can use it before it is washed on. It also introduces higher dissolved oxygen and mixing of nutrients not found in backwaters or side channels. A similar result was found in an earlier study on the upper St. Croix near St. Croix State Park (C.A. DeGuire et al. 2009).

•All habitats were dominated by collector/gatherer feeders.

•Taxonomic diversity and abundance were highest in sites that were relatively stable, and not necessarily related to flow.

•Abundance and diversity seem to be related to dissolved oxygen levels, except in the stagnant backwater, possibly due to low sample size.

•These conclusions may be used as preliminary work for more detailed studies by the National Park Service and other agencies.

Acknowledgements

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